Historical reconstruction of spatial distribution of land use/land cover in the early reclaimed time of Northeast China——Based on the HLURM model

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Understanding long-term human-environment interactions is essential to understanding changes in terrestrial ecosystems and this requires historical reconstruction of past land cover changes. Historical reconstruction of land use/land cover (LULC) aims to reproduce information concerning past land use, not only the quantity of land use/cover in a historical period, but also the spatial distribution. Recently, improved remote sensing technology has made feasible the continuous observation of land cover. However, remotely-sensed data have only existed for the last four decades at most, following the advent of the first land satellite, LandSat-1, launched in 1972. Prior to that, other data sources must be relied on, which may cover the global scale but often inconsistently. In this context, increasing numbers of researchers have made efforts to reconstruct historical LULC based on prime data sources and research approaches. And significant progress in gathering historical land change data has been made both at global and regional scales. However, most of the existing historical LULC reconstructions do not sufficiently meet the requirements of climate assessments due to insufficient spatial and thematic detail and the lack of consideration of various land change types. Most current studies do not thematically represent 100% of the land area, and ignore the consideration of completing land categories and land conversion types. Current research mainly focuses on arable land, wetland and forestland and it does not provide information on land categories such as settlement, water, and other land types. It is a research direction to build historical spatial land use and land cover datasets with high resolution. This paper provides a retrospective overview of historical reconstruction methods of past land-cover based on the prime data sources and research approaches. This research also explored the possibility of building a spatial-explicit modeling framework named HLURM (Historic Land Use Reconstruction Model) to reconstruct the spatial distribution of land use in the early reclaimed time of Northeast China. HLURM model consists of four main modules: quantity control module, spatial conversion rule module, probability module and spatial allocation module. This model could produce backward projections by analyzing land use and its change in recent decades, which is a dynamically dependent approach based on three assumptions that current spatial patterns of land use are dynamically dependent on the historic one, the boundary of historic land use with human activities does not exceed the union range of each land use type, and factors for land suitability do not change over time.